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The Balance of Nuclear Forces in Central Europe

An Intelligence Assessment

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NOFORN–	Not Releasable to Foreign Nationals
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The Balance of Nuclear Forces in Central Europe

Central Intelligence Agency
National Foreign Assessment Center

January 1978

Key Judgments

Improvements that have been made in Soviet tactical nuclear forces in Central Europe over the past several years have eroded much of NATO's long-standing nuclear advantage there. As a result, Pact planners probably consider that the credibility and, therefore, the utility of NATO's nuclear forces as a counter to the Pact's preponderance in conventional forces have been reduced. If present trends continue and Soviet forces over the next few years attain a general nuclear parity in Central Europe, the basis of deterrence there will shift more to the conventional forces of both sides.

NATO still retains an overall advantage in force readiness and in the numbers and quality of its tactical nuclear systems, most notably in nuclear artillery. NATO's nuclear weapons are generally superior in their variety, technical sophistication, and flexibility, and a number of programs are under way to increase their capabilities.

Recent Soviet force improvement programs have been aimed at redressing the nuclear imbalance in Central Europe. The most significant of these have been the increases in the number and quality of Soviet tactical nuclear delivery aircraft in Central Europe and in the number of nuclear weapons allocated to Soviet forces there. Of potential importance is the development of nuclear rounds for heavy artillery units in the USSR. If such weapons are deployed with Soviet forces in Central Europe, as seems likely soon, they will break NATO's monopoly on nuclear artillery there and hence reduce the deterrent value of these weapons.

Force improvements carried out to date have increased the flexibility with which the Soviets can employ their tactical nuclear forces and provided them with a capability for conducting theater nuclear war at higher levels of

intensity before having to resort to the peripheral strike forces based on Soviet territory.

The evidence indicates that the Soviets are becoming more comfortable with the theater nuclear balance and are exploring alternatives to their long-held strategy of massive response to any NATO first use of nuclear weapons. Although the Soviets still see little chance for limiting escalation once the nuclear threshold has been crossed, there is a growing Soviet tendency to plan to use nuclear weapons in Europe with greater flexibility and restraint, at least initially, than was seen during the sixties.

Whatever increased confidence Soviet planners may have gained is likely to be tempered by an awareness of NATO's projected force improvements and its ability to quickly open new areas of competition. Cruise missiles, for example, represent a development that from the Soviet perspective has the potential for profoundly affecting the nuclear balance in Europe. These NATO improvements probably would also serve as an impetus to efforts by the Soviets to further improve their own theater nuclear forces.

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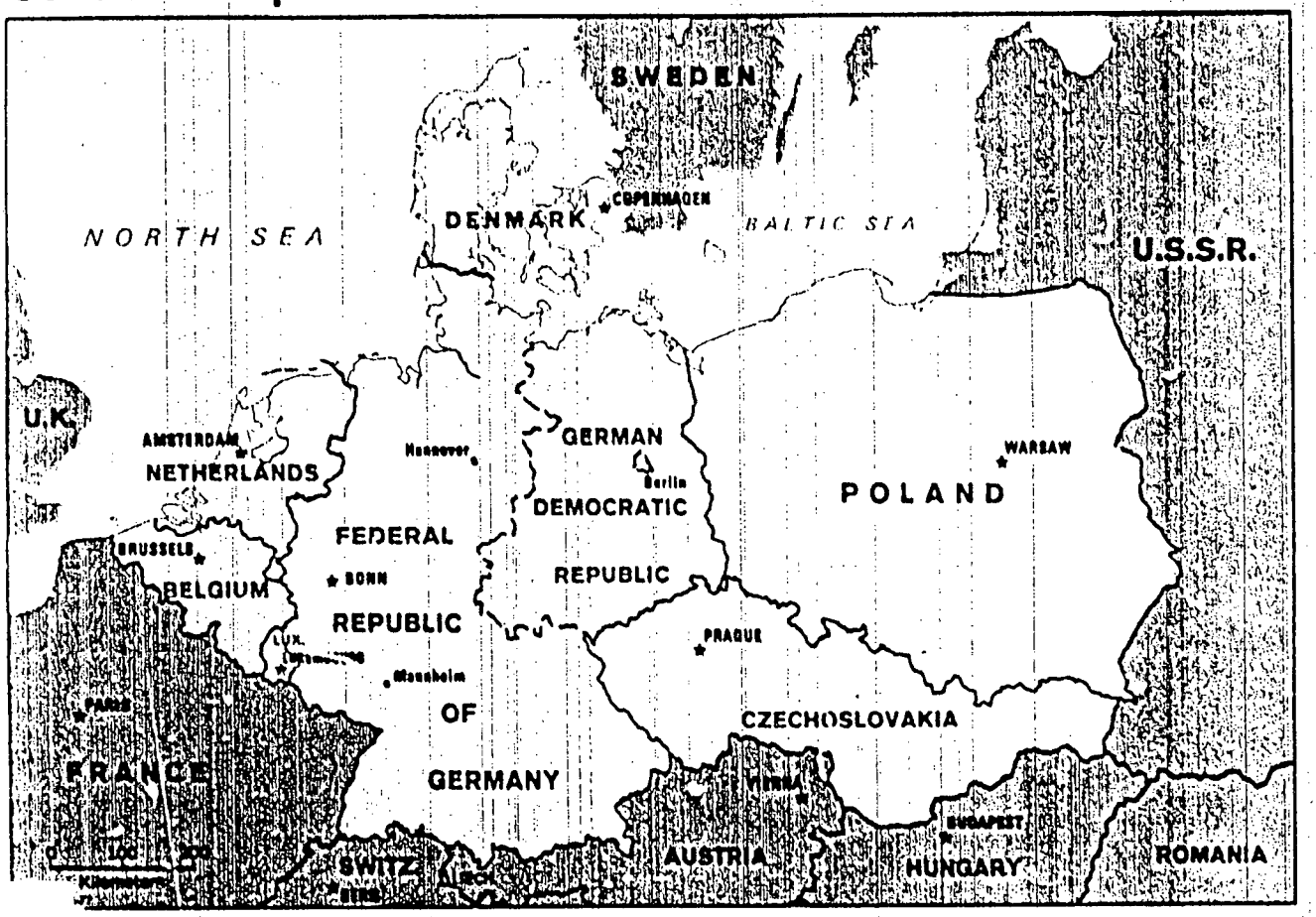
PREFACE

Both NATO and Warsaw Pact forces in Central Europe have long maintained a variety of nuclear weapon systems, which they have occasionally upgraded. Over the past several years, however, improvements in Pact forces have been made at such a pace and magnitude as to cause concern that the West will lose its longstanding advantage in tactical nuclear capability.

This paper looks at the present array of nuclear systems within Central Europe and discusses some indexes of the exisiting numerical and qualitative balance. It then evaluates trends in the balance as a result of the deployment of new systems and relates those trends to the nuclear doctrines and employment policies of the two alliances. Finally it assesses the effect of these trends on the overall balance of ground and tactical air forces in Central Europe—particularly as this balance contributes to deterrence there.

Central Europe



The Balance of Nuclear Forces in Central Europe

A Current Assessment

A comparison of forces and trends indicates that the Warsaw Pact is closing the gap between the capabilities of its nuclear forces in Central Europe and those of NATO. Although NATO currently has quantitative and qualitative advantages, these have been declining over the past several years as the Soviets have both modernized and expanded their nuclear forces there. The immediate result of these efforts has been to enhance the Pact's capabilities to wage nuclear war in Central Europe at whatever level NATO chooses, using only locally based systems.

The military doctrine of both sides generally holds that a conflict in Europe would escalate to nuclear warfare, but the Pact, probably because of its longstanding inferiority in battlefield nuclear capabilities, has placed greater emphasis than NATO on developing passive defense and decontamination capabilities. Because of the uncertainties associated with widespread use of nuclear weapons, it is problematical how effective these preparations would be.

As shown by table 1, NATO still enjoys an overall advantage in numbers of tactical nuclear delivery systems based in Europe. This advantage is vested primarily in NATO's large force of nuclear artillery. In the past few years the Pact has overtaken NATO in the number of tactical surface-to-surface missiles in Central Europe and tactical aircraft intended for nuclear delivery missions there.

Nuclear artillery also provides NATO with a qualitative advantage in battlefield support capabilities that is presently lacking in Warsaw Pact forces. With low-yield nuclear rounds and the accuracy inherent in tube artillery, NATO artillery can provide responsive, close-in support for engaged ground forces units. Thus, Pact forces massing immediately in front of NATO lines would still be subject to nuclear strikes. With their larger yield warheads and less accurate rocket and aircraft delivery systems, Pact nuclear forces would be less capable of striking targets close to their own troops.

The military utility of NATO's nuclear artillery, however, is diminished by its maldeployment within the European theater. Historically, the main avenue of attack into Central Europe

Table 1

Tactical Nuclear Delivery Systems in Central Europe [1]

	NATO		Warsaw Pact	
	1968 [2]	1977	1968	1977
Aircraft [3]	360	380	100	400
Surface-to-surface missiles and rockets	320 [4]	300	285	390 [5]
Nuclear artillery	NA	670 [6]	0	0

[1] French tactical nuclear systems are excluded.

[2] NATO data for 1968 are incomplete, and figures should be considered rough estimates.

[3] The figure for the NATO side represents those aircraft that would be assigned a primary mission of nuclear delivery under NATO planning. We do not know how many Pact aircraft are similarly assigned, but some 400 pilots (about one squadron in each regiment equipped with nuclear-capable aircraft) train frequently in nuclear delivery techniques and are believed to have a primary responsibility for nuclear delivery under Pact planning. Both sides have additional aircraft that are technically capable of delivering nuclear weapons, but their crews practice delivery techniques infrequently, if at all, and we do not believe that they add significantly to the nuclear delivery capabilities of either side.

[4] Assumes less than one-for-one replacement by Lance.

[5] The Soviets appear to have added six launchers to at least one of their Scud brigades in East Germany. If this program were extended to all the Soviet Scud brigades in Central Europe, 54 launchers could be added to this total.

[6] Nuclear-certified NATO gun crews. No comparable figure for 1968 is available.

has been via the North German Plain. In the area defended by the Northern Army Group (NORTHAG), the terrain most favors the attacker, the distance to the Benelux ports is the shortest, and Warsaw Pact strength is the greatest.

We estimate that the main thrust of a Warsaw Pact attack in Central Europe would fall in precisely this area—between Hannover and Mannheim (see map). Thus, the heaviest assaults most likely would strike the German I Corps and the British I Corps. Yet most of NATO's nuclear artillery is deployed with US forces in areas where the terrain is more favorable to the defender and the enemy threat is less critical.

The remainder of NATO's present array of tactical nuclear weapons also is generally superior in technical sophistication and flexibility. Here again, however, the technological gap is narrowing, particularly in the case of tactical aviation.

Tactical Missiles

NATO's tactical missile forces have two advantages over the Pact's. First, the Pact's logistics requirements are greater. This burdens Soviet missile units with a more cumbersome support structure that could slow their movement and, if it were successfully attacked, sharply cut their operational effectiveness. Furthermore, older Soviet missiles and warheads must move through a complex logistics network before they reach user units. The Scud missile uses liquid propellants—thus requiring extensive preparation—and the sensitivity of warheads to temperature necessitates environmental controls. On the other hand, the missile systems now in use by NATO (Pershing, Honest John, Lance) use primarily solid propellants, and US warheads do not need rigid environmental controls.

The other major advantage of NATO is that its missile forces are capable of reacting more quickly. Some of NATO's missile force is maintained on alert, with warheads mated to missiles that are capable of launch within 20 minutes. No Soviet missiles are so maintained. Because of the preparations required, a Soviet Scud brigade takes at least four hours to deploy and to reach its highest readiness condition.

Because of the logistic and technical problems with their older systems, the Soviets probably view an indefinite conventional phase preceding nuclear operations as a complicating factor in achieving and maintaining peak readiness to launch or respond to nuclear attacks.

Tactical Aviation

NATO's tactical air forces are still generally superior to those of the Pact in pilot training and particularly avionics. NATO aircraft have inertial guidance or terrain-following navigation systems which give them a greater capability to penetrate at low altitudes and locate their targets.

Newer, improved Soviet aircraft, however, have largely eroded NATO's advantage in overall range capability. The primary NATO nuclear delivery aircraft of the early seventies—the F-4C and the 104G—had nearly twice the range of the Pact's SU-7 Fitter. This enabled them to strike targets deep in Pact territory from bases that were beyond the range of most Pact tactical aircraft. This range gap has been closed by new Soviet fighters such as the SU-17 Fitter and the MIG-23 Flogger. Their range characteristics for nuclear attack missions compare favorably to most NATO attack aircraft now deployed in Europe.

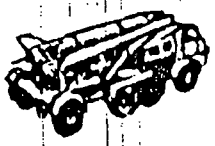
As with the tactical missile forces, NATO's tactical air forces are maintained at a higher readiness for nuclear operations than are their Pact counterparts. In peacetime, some NATO aircraft are on alert with nuclear weapons aboard. No Pact aircraft are known to be in a similar state of readiness.

Warsaw Pact Forces—Growth and Modernization

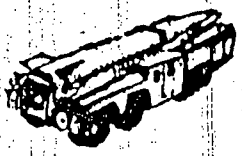
Since the late sixties the Soviet approach to nuclear war in Europe has undergone major changes. The Soviets have experimented with various strategies for nuclear conflict. The strategies, in turn, have been made possible by the growth and modernization of the USSR's forward-based nuclear forces.

Missiles and Rockets of Warsaw Pact and NATO

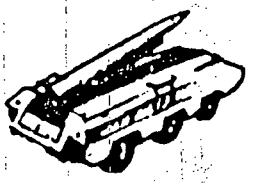
Battlefield Support Systems



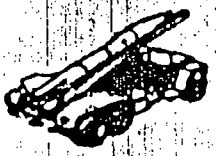
FROG-7



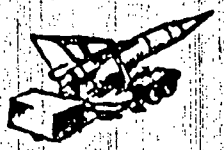
Scud-B



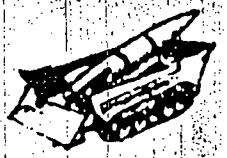
SS-21 (Not in Central Europe)



Honest John

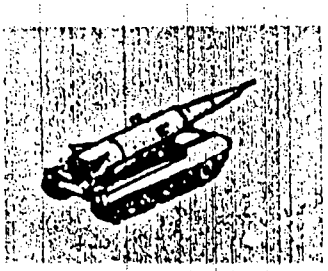


Sergeant

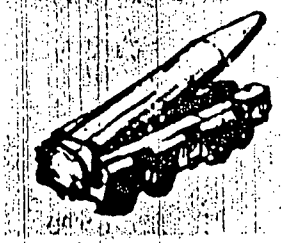


Lance

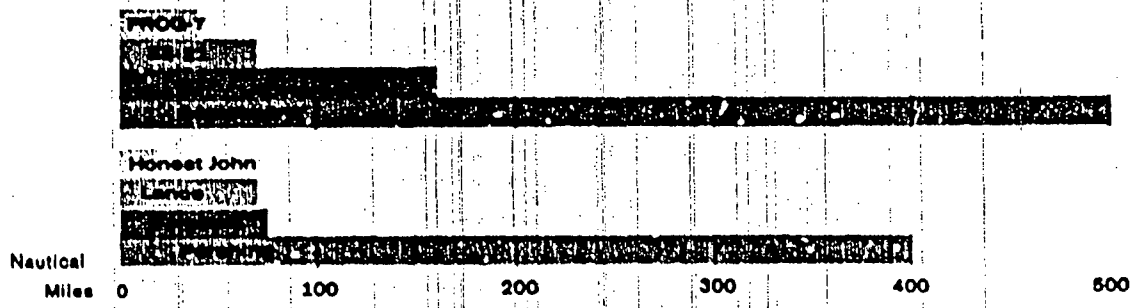
Theater Interdiction Systems



Pershing



Scaleboard (Not in Central Europe)



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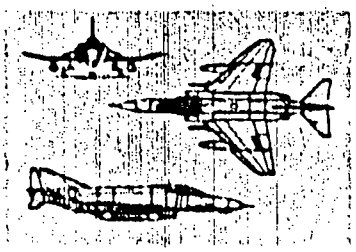
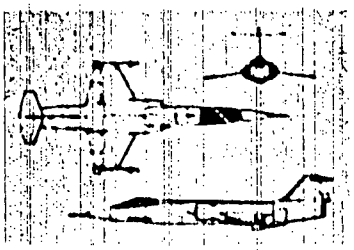
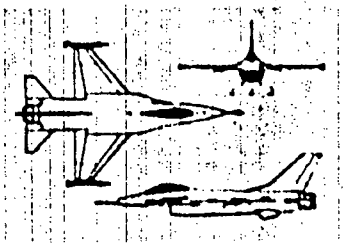
NATO and Warsaw Pact Tactical Aviation



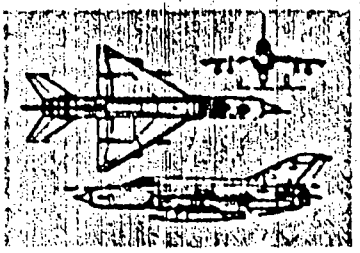
F-4



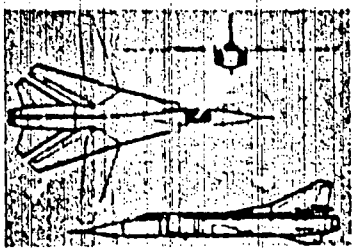
F-104



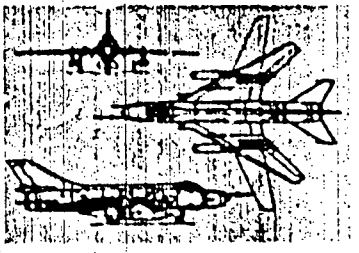
F-16 (Not yet in Central Europe)



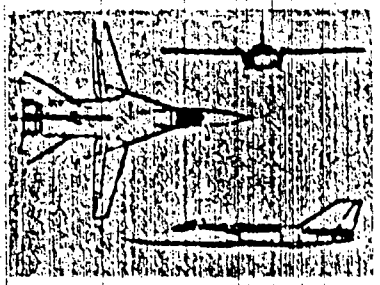
MIG-21



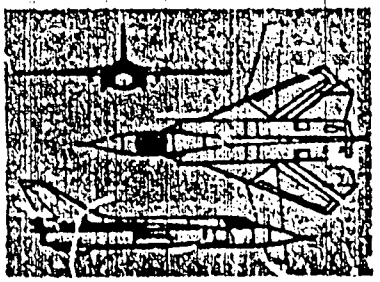
MIG-23



SU-17

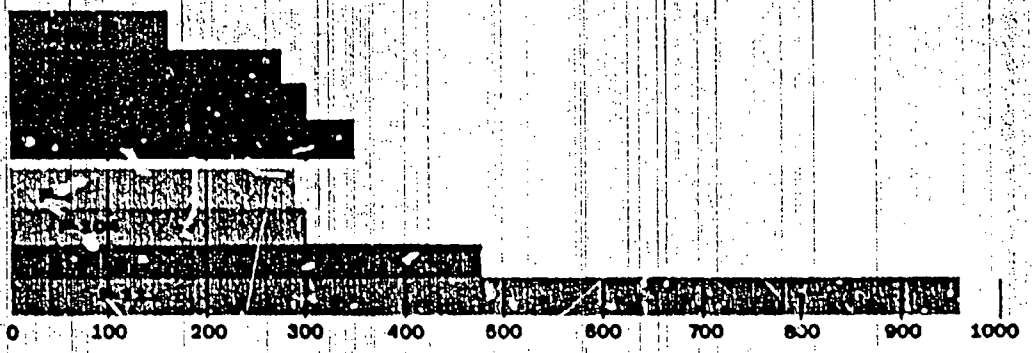


F-111 (Based in UK)



SU-19 (Based in USSR)

Combat Radius for a Nuclear Mission*



* These radii are for illustrative purposes only. Actual combat radii of these aircraft may vary according to a number of operational factors, including operational loading, ingress and egress altitudes, loiter times over target, and fuel reserves.

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Evolving Perceptions

Soviet doctrine during the early sixties postulated that any war involving the Soviet Union and the West would be a decisive global conflict. The Soviets considered that the outcome would be determined largely by massive nuclear exchanges during the first few hours. Because of the decisive advantage they believed would accrue to the side that struck first on a massive scale, they put a premium on preemption. Contributing to the pressure for preemption in a European war were the vulnerability of Soviet medium- and intermediate-range ballistic missile systems based in the USSR and the relative dearth of Soviet nuclear systems in Central Europe.

According to the Soviet doctrine of that period, the first Soviet nuclear strike in a European conflict would be one of maximum strength delivered throughout the entire depth of the theater of war. Because of the range limitations of Soviet tactical nuclear systems, the initial strike would depend heavily on Soviet systems based in the USSR. The sequence of this strike would be generally as follows:

- The Strategic Rocket Forces (SRF) would launch on signal by the Supreme High Command.
- Simultaneously with the SRF strikes, or as soon as possible thereafter, the missile submarines and ground forces rocket troops would strike and the long-range aircraft would take off.

Another reason for the Soviets' emphasis on preemption may have been their perception, reflected in their military literature of the early to mid-sixties, that NATO's tactical aircraft constituted the majority of the Alliance's means of nuclear delivery. These tactical aviation units were concentrated at a small number of available fields and would have been highly vulnerable to a massive preemptive strike. In the context of a theater nuclear threat consisting largely of aircraft operating from a few known, fixed bases, preemption could rightly have been considered the most effective strategy.

In the mid-sixties the perceptions of Soviet military planners changed. They came to believe that the bulk of NATO's nuclear delivery capability was vested not in tactical aviation but in the missiles, rockets, and nuclear artillery deployed with army corps and divisions. This roughly coincided with the initial deployments of the US M-109 self-propelled 155-mm howitzer into West Germany. These deployments appreciably expanded NATO's nuclear artillery force and the target base facing Warsaw Pact planners.

The Soviets further recognized that, because of its expanding nuclear artillery force, NATO had a significant advantage in battlefield nuclear capabilities and that their capabilities for close-in support to troops were much less than those of NATO. Because of this, Pact planners estimated that even after the Pact had delivered a massive nuclear strike, NATO would retain strong defending forces opposite the Pact's main axes of advance.

Soviet Changes

Recognition of these deficiencies has led the Soviets to experiment with alternative nuclear strategies and has affected the nuclear forces they have in Central Europe. Doctrinal changes usually take several years to implement, however, as new equipment is fielded and tactics are developed to meet the new requirements.

Alternative Strategies

During the mid- to late sixties Soviet military theorists advanced nuclear tactics designed to offset the USSR's pronounced inferiority in tactical nuclear systems. These included:

- Moving from a massive, preemptive, "one act" strike to a still massive system of grouped and single nuclear strikes delivered as important targets emerged.
- Giving more emphasis in nuclear targeting to striking large ground force units in the hope of destroying the tactical nuclear weapons deployed with them.
- Giving Frontal Aviation a greater role against those small and mobile nuclear sys-

tems that missiles would have difficulty destroying.

- Investigating the extent to which nuclear artillery and low-yield projectiles could contribute to combat flexibility.

During this period the Soviets apparently examined the possibility of limited nuclear strikes, but the predominant Soviet response to NATO's first use continued to be a theaterwide nuclear strike.

Planning Variations in the Seventies

Since 1970, Soviet planning apparently has moved away from exclusive reliance on massive nuclear retaliation and probably now includes other options for conducting nuclear war. Planning variants have included:

- *Delaying a response to NATO's first use of nuclear weapons.* This suggests that Soviet planners may have begun to regard the limited, selective use of nuclear weapons by NATO as a distinctive, if transitional, phase of conflict that would not necessarily require an immediate nuclear response.
- *Responding at the lower end of the nuclear spectrum with limited strikes by forward-based systems rather than with massive strikes involving USSR-based systems.* This variation would call for the Soviets' initial use of nuclear weapons to be more limited in intensity, matching more closely NATO's first use and for the Pact to launch a massive strike only when NATO is preparing to deliver its own massive, theaterwide strike.
- *Escalating the intensity of nuclear strikes over time.* The Soviets apparently are at least considering gradual escalation of a conflict, either at their own volition or in response to NATO escalation.
- *Initiating limited nuclear strikes with tactical systems in support of specific military goals.* The Soviets might consider using nuclear weapons first if they were on the defensive or possibly to break through NATO defenses, but we do not believe that these options enjoy any real prominance in Soviet planning.
- *Preempting massively when intelligence indicates that NATO is preparing to deliver massive, widespread nuclear strikes.* This preemption variation differs from the doctrine of the sixties, which specified that a massive initial strike be delivered upon detection of enemy preparations to employ nuclear weapons on any scale whatever.

These planning variations suggest that the Soviets are becoming more comfortable with the theater nuclear balance and are exploring alternatives to their strategy of massive response. The extent to which such alternatives have become part of official Soviet doctrine is unclear. At present there seems to be a tendency to use nuclear weapons, at least initially, with greater flexibility and restraint, but the evidence indicates that Soviet planners still see little prospect for limiting escalation once the nuclear threshold is crossed.

With their own improved in-theater nuclear capabilities mitigating the requirement to respond massively to any NATO nuclear initiative, the Soviets may now believe it is in their interest to delay widespread nuclear use as long as possible. They probably reason that a lengthy period of conventional, or even limited nuclear, warfare would afford them greater opportunity to seek out and destroy NATO's nuclear delivery systems, thus reducing the impact of any eventual theaterwide nuclear attack by the West. Such a delay would also permit Pact forces to prosecute an offensive without the uncertainties imposed by the widespread use of nuclear weapons.

Force Trends

The Soviets are carrying out a broad variety of force improvements in an effort to reduce the nuclear imbalance they have perceived in the European theater. These include:

- *Developing and deploying a new generation of nuclear delivery systems with characteristics superior to those of their predecessors.* Newer models of Soviet tactical aircraft have greatly improved range and payload capabilities, and more effective tactical missiles will be deployed soon. The 120-km SS-21 will offer significant improve-

ments in range and accuracy over the FROG, which it is replacing. The SS-X-22 appears to be approaching initial operational capability and could be deployed at any time. It is similar to the Scaleboard system and apparently is intended to replace it. The Soviets may soon begin flight testing another new short-range ballistic missile, which probably will replace the aging Scud.

- *Significantly increasing the inventory of nuclear delivery systems in Europe.* Expansion has already included about a one-third increase in the number of tactical missile launchers and a tripling of nuclear-capable delivery aircraft in Central Europe since 1970. Another round of increases in Soviet tactical nuclear forces in Central Europe may be under way. One Scud brigade has apparently been increased from 12 to 18 launchers. If all Soviet Scud brigades there are similarly augmented—as will probably be the case—the force will have an additional 54 launchers.

- *Increasing the numbers of nuclear weapons they plan to use in Central Europe.*

- *Increasing the warhead yields for their tactical missiles.* The motivations for the larger yields are unclear, but the Soviets may perceive a requirement for greater areas of destruction to compensate for the relatively poor accuracy of their missile systems and the lack of timely, accurate reconnaissance data on small, mobile targets.

The evidence also suggests that Frontal Aviation is replacing missiles as the USSR's predominant means for delivering tactical nuclear weapons. Beginning about 1959 and continuing throughout most of the sixties, about 70 percent of any given front's nuclear weapons were missiles, Frontal Aviation being used primarily for providing air defense to Pact ground units and installations. The Soviets in the late fifties also developed huge self-propelled mortars to deliver nuclear rounds, but these too were discarded in favor of tactical missiles.

Table 2

Soviet Tactical Nuclear Delivery Systems, Weapons Allocations, and Weapons Yields in Central Europe

	1968	1977
Delivery Systems		
Aircraft [1]	300/100	969/300
Surface-to-surface missiles	150-170	228
Nuclear Weapons Allocations to Central Front	500	1,500
Weapon yields (kt) [2]		
Bomb	15-100	0.5-200
Missile warhead		
FROG	3-40	10/200
Scud	10-100	10/300
Artillery		2/5 (est.)

[1] Figure to left of slash represents nuclear-capable aircraft. Figure to right represents our estimate of Soviet nuclear-qualified pilots.

[2] Yield figures separated by a dash indicate a number of warheads with yields within a certain range. Figures separated by a slash represent distinct yields.

The evidence now indicates that the nuclear attack role of Frontal Aviation has expanded. In fact, aircraft may now be allocated as much as two-thirds of a front's nuclear weapons. This shift probably reflects a Soviet view that aircraft are better suited than missiles for delivering strikes in the immediate battlefield area and for attacking mobile targets throughout the theater.

Coinciding with this expansion of Frontal Aviation's battlefield role has been a renewed interest in nuclear artillery. In the early seventies the Soviets formed heavy artillery units equipped with obsolescent 203-mm howitzers and 240-mm mortars. The nine such units identified in the USSR thus far are colocated with Scaleboard or Scud brigades, suggesting that they have a nuclear capability. New 203-mm self-propelled cannons and 240-mm self-propelled mortars probably will eventually replace all of the older towed weapons.

For the near term, however, NATO's nuclear advantage appears secure. Even if the Soviets deployed nuclear artillery to Central Europe in the near future—as seems likely—they would require several years to develop the doctrine, storage, handling procedures, training, and stock

of nuclear rounds needed to match NATO's war-fighting capabilities. The immediate military effect of such deployment would be to expand the nuclear target base facing NATO, because all Soviet and East European artillery pieces of the type associated with nuclear rounds would have to be considered nuclear capable.

The Soviets' renewed interest in nuclear artillery suggests that they view the expanded use of Frontal Aviation as only a partial solution to the problems of providing close-in nuclear support to ground forces and destroying NATO's many nuclear systems in the tactical depth of the theater. The Soviets apparently consider that, because NATO's nuclear-capable artillery would be deployed close to the battleline, Pact artillery fire would be the most effective and responsive means for destroying it.

Theater Strike Forces

The Soviets are also undertaking improvements in peripheral strategic forces that will affect their war-fighting doctrine and capabilities in Central Europe. Potentially the greatest improvement will result from deployment of the mobile SS-X-20 IRBM to replace the old, fixed SS-4 and SS-5 launchers. In addition to its multiple warheads and increased accuracy, the SS-X-20 apparently will have a refire capability. It will provide the Soviets with a theater strike weapon that, depending on the manner of its deployment, can be significantly less vulnerable to preemptive attack than their present missile force.

The reduced vulnerability of these missiles could lessen the Soviet incentive to launch them preemptively to prevent their destruction by a NATO first strike. This "shoot it or lose it" philosophy has been one of the driving factors behind the preemptive nature of Soviet theater nuclear doctrine. Widespread deployment of the SS-X-20 will provide Soviet planners with a theater strike force more compatible with what appears to be a more flexible and confident theater nuclear doctrine.

NATO's Forces

Two factors have combined over the past few years to create pressures for reevaluating US tactical nuclear doctrine for Europe and for reducing and modernizing US nuclear forces there. First, Congress in 1974 called for a reassessment of the rationale of maintaining US theater nuclear forces in Europe and for removal of those nuclear warheads that, in number or type, were not essential for Europe's defense. Secondly, at the MBFR talks the West has proposed in its Option III package to withdraw from Europe 1,000 nuclear warheads, 90 nuclear delivery systems—54 F-4s and 36 Pershing missiles—and 29,000 US ground troops in exchange for the withdrawal of a Soviet tank army.

Employment Policy

In response to the Congressional mandate, the Secretary of Defense in April 1975 submitted a report that made the following judgments concerning the purposes and capabilities of US nuclear forces deployed in Europe:

- Although tactical nuclear forces cannot substitute for adequate conventional forces, they could temporarily affect the tactical situation and create a stalemate or NATO advantage that could be used to induce negotiations.
- A nuclear strike by NATO to blunt a Warsaw Pact conventional attack that threatened to overwhelm NATO's defenses should clearly be limited and defensive in nature, so as to reduce the risks of escalation.
- On the other hand, the attack should be delivered with sufficient shock and intensity to forcibly change the Warsaw Pact leaders' perceptions of the risks involved and to create a situation conducive to negotiations.

Overall, US doctrine holds that deliberate escalation of a conflict in Europe could involve the limited use of nuclear weapons in any or all of the following ways:

- Use in a clearly defensive role, as in employing nuclear-armed Nike Hercules missiles for air defense or atomic demolition munitions for area denial.
- Demonstrative use, or launching a strike designed to convey resolve but to minimize the risk of provoking an escalatory response.

- Selective nuclear strikes on interdiction targets.
- Selective nuclear strikes against other suitable military targets.

In general, planning guidelines emphasize that NATO must retain the freedom to eschew early use of nuclear weapons if circumstances do not demand their use, that only conventional forces should be employed initially to meet a conventional attack, but that nuclear weapons should not be held back until conventional forces are exhausted.

NATO's goal in using nuclear weapons would shift from a chiefly political to a chiefly military one as the intensity of nuclear conflict increased. The purpose in low-key initiation of nuclear war would be primarily political—that is, to restore deterrence by inducing a change of mind in Soviet political leaders through a demonstration of NATO's resolve and determination and, by implication, its willingness to escalate the conflict. Indeed, NATO would consider the primary purpose even in early follow-on use to be political, as it would see little military advantage to such escalation against an enemy that also has substantial tactical nuclear capabilities. This early stage of escalation would be intended not to defeat the enemy but to show NATO's—and test the enemy's—willingness to raise the stakes.

With escalation to higher levels of nuclear conflict, NATO's use of nuclear weapons would be driven more by military requirements. That is, with more widespread usage, strikes would be intended to destroy attacking forces and to freeze the battlefield for a period sufficient for political negotiations to restore prewar borders.

Force Trends

Plans for the modernization of NATO's tactical nuclear forces have focused upon the development of more efficient nuclear warheads and a changing mix in US tactical air forces based in Europe. Congressional review and the MBFR negotiations have probably had an impact on this modernization. Questions about the appropriate size and composition of US nuclear forces in Europe are still under review.

The Stockpile

The US nuclear stockpile began to grow in the mid-fifties, when NATO's nuclear strategy was one of massive retaliation. The growth in number and variety of warheads continued during the early to mid-1960s with the new doctrine of flexible response, which required the US to be prepared for nuclear combat with wide variations in tactics and levels of intensity. Growth in the stockpile was stopped between 1967 and 1968 when ceilings were established.

Missiles and Artillery

The trend in US warhead design has been toward lower yields, in keeping with NATO's desire for a capability to minimize collateral damage from strikes against Pact forces on NATO territory. Lower yields have been made possible by advances in warhead design, while effectiveness has been enhanced by improvements in missile accuracy.

Probably the most notable of the new, lower yield warheads are the enhanced radiation (neutron) weapons. These provide initial levels of lethal radiation equal to that normally obtained from a standard fission weapon whose yield is some 10 times greater. There is presently no practical defense against the high levels of radiation emitted by neutron weapons.

Neutron warheads for the Lance missile and the 155-mm and 8-inch howitzers are in various stages of development. The decision to add these weapons to the operational inventory and deploy them in Europe is still under executive review.

Tactical Aviation

The employment concepts for the US tactical air forces in Europe are changing in response to the Pact's increased conventional, rather than nuclear, capabilities. US nuclear doctrine for tactical aviation, which until recently emphasized widespread, preplanned attacks against fixed targets as part of a massive theaterwide nuclear

strike plan, is now placing more emphasis on limited and selective strikes. The new emphasis is more in tune with NATO's doctrine of flexible response, which calls for a carefully modulated riposte to a Pact conventional attack.

The new planning calls for more flexible use of tactical air forces against mobile battlefield targets. The current trend toward increased commitment of missile warheads—particularly SLBM warheads—for fixed targets would permit allocating a greater proportion of tactical aircraft sorties to both conventional missions and selective nuclear strikes.

With the US Air Force's emphasis on upgrading its conventional rather than its nuclear strength, there probably will be a decline in the number of nuclear-capable aircraft as new models enter the inventory. Many of the new US aircraft to be deployed in Europe in the next few years—the F-15 and A-10, for example—are designed specifically for air superiority or ground attack missions and will not be nuclear capable. The aircraft they are intended to replace are all technically capable of delivering nuclear bombs, and their pilots receive some nuclear-delivery training.

Nevertheless, no significant degradation in NATO's overall tactical nuclear capability is likely. This is because one of the aircraft to be introduced is the nuclear-capable F-16, which is far superior to the aircraft it will replace; the number of US F-111s in the UK is being doubled; and the number of Poseidon warheads allocated to Central Europe has been increased.

Implications for Deterrence

Judgment as to whether the growth and modernization of the Warsaw Pact's nuclear forces have lessened deterrence in Europe can be no more than speculative, because deterrence is based on the perceptions of both sides. The deterrent effect of NATO's theater nuclear forces is dependent on the Soviet leadership's perception of NATO's force capabilities, the credibility of NATO's threat to use these forces if necessary to halt aggression, and the losses the Pact would incur if NATO's threat were ignored.

During the sixties NATO's clear superiority in nuclear forces constituted a deterrent against both conventional and nuclear attack by the Warsaw Pact. The large number of NATO battlefield and theater nuclear weapons gave the Alliance a range of employment capabilities that the Pact could not offset with in-theater systems. To match NATO's capability to fight a theater nuclear war, Soviet leaders would have been forced to escalate the conflict by using systems based in the USSR, thus inviting retaliatory strikes against Soviet territory.

Given NATO's large advantage in the number, sophistication, and readiness of nuclear systems during the sixties, Soviet planners probably believed that the Alliance would be strongly motivated to use nuclear weapons at the beginning or early stages of a war in Europe. Soviet planners believed that, after nuclear attacks by both sides, NATO's military position would be better than the Pact's.

With the improvements in their own tactical nuclear forces over the past several years, however, Soviet leaders probably now consider that the military advantages to NATO of using nuclear weapons have decreased and that the Alliance would be more reluctant to use them in response to a conventional attack. To the extent that this is the case, the growth of the Pact's tactical nuclear forces has reduced the credibility—and therefore the utility—of NATO's theater nuclear weapons as a counter to the Pact's conventional strength. If present trends continued and Warsaw Pact nuclear forces approached a general parity with those of NATO, the basis of deterrence in Europe would shift further to the conventional forces of both sides.

Outlook

Whatever increased confidence the Soviets may have gained from their force improvements is likely to be tempered by their awareness of the US ability to quickly open new areas of competition. Cruise missiles represent just such an area that from the Soviet perspective has the potential for profoundly affecting the nuclear balance.

The deployment of such missiles to Europe could confront the Soviets with a great number of

nuclear weapons that would be difficult to detect. A further complicating factor is that, because of the high European interest in cruise missiles, the US might transfer them or their associated technology to its NATO allies.

Thus, although the Soviets may feel more comfortable with the present nuclear balance in Europe, their public commentary and their positions in the SALT II negotiations reflect a deep concern about the potential of cruise missiles for increasing both the tactical and the theater nuclear threat. Such concern may be reflected in the near term by a continued effort to expand and improve their own theater nuclear forces.

The author of this paper is
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